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183

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
Division of Forest Insect Investigations

FOREST INSECT AERIAL SURVEY
CALIFORNIA REGION
Fall 1953

Introduction

The 1953 aerial survey of forest insect conditions in California of which G. L. Downing was in charge, was flown slightly earlier this year than in previous years. The survey started on September 15 and concluded on October 6. As in past surveys, representatives of State, Federal, and private forestry were included in the flights over their respective holdings. However, due to the many fires occurring during the period the survey was in progress, it was not possible for many of the cooperators to fly this year. Practically all commercial stands of timber within the State were flown except the Six Rivers National Forest, the west half of the Trinity National Forest (where cloudy weather forced cancellation of flight plans) and the Angeles National Forest (where extremely high temperatures and heavy smog conditions were encountered). A total of 98 hours were spent on the survey, of which 31.25 hours were ferry time and 57.35 hours were survey time.

Objectives

While a survey of this type is most useful in gaining a year by year account of conditions in general throughout the State, it is also of paramount value in detecting areas of insect loss that have not previously been reported. Flights are planned to cover all timbered areas as thoroughly as time and finances allow and include all areas of known current and recent loss. In keeping with our policy of informing cooperators of the current insect conditions present on their lands, flights were arranged to accommodate all interested land-managing representatives.

Preparations

A week prior to the beginning of the actual flying, letters were sent to all Forest Supervisors, National Park Superintendents, Deputy State Foresters and interested industry representatives informing them of our tentative schedule and inviting their participation.

Prior to the flying phase of the survey a week of office preparation is desirable, although this was not possible this year due to the pressure of other survey activities.

A complete set of 1/4" = 1 mile maps of California's National Forests was assembled. Many of the maps were used on the previous year's survey and therefore had the old flight lines drawn on. This proved to be an aid in some instances. Two sets of colored pencils, an art gum eraser, several rubber bands and aluminum sheets (15" x 15") used as backing for the maps were assembled. Folding the maps around the aluminum sheets and holding them with rubber bands is a very satisfactory method.

Equipment and Personnel

A Cessna 170-B aircraft, from the Aircraft and Special Equipment Center, Oklahoma City, Oklahoma, was used on the survey (Figure 1). This is a single-engine, four-place, high-wing, all-metal airplane, powered with a 145 horsepower Continental engine.

Figure 1. Cessna 170-B airplane from Aircraft and Special Equipment Center, Oklahoma, used in 1953 forest insect survey in California. Observer G. L. Downing (left) and Pilot Val Mackiewicz.

Personnel participating in the survey included the following: Pilot Val Mackiewicz, Aircraft and Special Equipment Center, Oklahoma City, Oklahoma; observers Boyd E. Wickman, Malcolm M. Furniss, and George L. Downing of the Forest Insect Laboratory, Berkeley, California; cooperators: Forest Service (10), California State Division of Forestry (3), National Park Service (2) and private foresters (8).

185

Survey Technique

Prior to each flight the current known insect infestations in the area to be flown were discussed with the representatives of the land-managing agencies present and these areas were noted, to make sure that a close look would be made during the course of the flight. No predetermined flight lines were used. Tracking was done in flight and the flight line sketched in the map as the flight progressed. Tracking and mapping were done by the observer, assisted in many cases by the pilot.

As an aid in checking areas which were mapped the previous year, the maps from those flights were placed on aluminum sheets and were made available for reference while in flight.

The following color-symbol combinations were used in sketch-mapping infestations:

Insect

Defoliator

Western pine beetle, Jeffrey pine beetle

Pine engraver

Mountain pine beetle

L = Lodgepole pine
S = Sugar pine

Fir engraver

Douglas-fir beetle

Relative Degrees of Infestation

Light — Moderate — Heavy — Very heavy

Flight Lines

10/1/53 → Arrow designates the direction flight was made. Date is placed along flight line, usually near the edge of the map. This is done for possible future reference.

Operation

The survey crew in the field made daily inquiries of the Berkeley Office to find out what replies had been received in regard to the letters sent out to cooperators. As the replies were received and it was known who would accompany the survey crew on future flights, arrangements were made with these individuals by telephone, usually two days in advance.

The following table briefly summarizes the operational phase of the 1953 aerial survey:

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
	(V. Mackiewicz pilot on all flights)					
9/15	Furniss, Downing; Wm. Welder, Fruit Growers Supply Co.	Fall River Mills AP	Fruit Growers ownership & part of Lassen N.F.	1:00	:35 (from Redding)	Exceptionally free of loss in general; moderate loss in pine along east edge of Thousand Lakes Wilderness area; heavy mistletoe damage in white fir S. of Magee Peak.
9/15	Furniss, Downing; J. S. Woolfolk, Lassen N.F.	"	Parts of Lassen N.F. and N.P.	1:05	-	Scattered light pine loss east & west of Butte Cr. rim; known infestations at Badger Mtn. & Butte Cr.; bad weather shortened this flight.
9/16	Furniss, Downing	" (Stopped at Alturas AP)	Modoc N.F.	3:30	-	Exceptionally free of loss in general; moderate Db loss in vicinity of Hayden Hill; light Db loss on west side of South Warner primitive area; heavy Db & Ips loss south of Joseph Cr. Basin in Warner Mtns; heavy fir loss SE of Fandango Peak.
9/17	Downing; R. Leatherman, McCloud Rvr Lbr Co.	Mt. Shasta City Mott Field	McCloud Rvr Lbr Co. ownership	1:30	:30 (from Fall Rvr)	Moderate Db loss in vicinity of Widow Spr.; moderate white fir loss W. & N. of Stouts Mdw.
"	Downing; R. Ritchie, McCloud Rvr Lbr Co.	"	East half Shasta N.F.	1:30	-	Heavy Dm loss in lodgepole S. of Whaleback Mtn; light Db loss W. of Eagle Rock LO & SW of Secret Spr. LO across drainage; light white fir loss N. & S. of Ball Mtn.
"	Downing	"	SE part of Shasta N.F.	:35	-	Light Db loss 3 mi NW of Lake Britton & at the head of Clark Cr.; light Douglas-fir loss at the head of Clark Cr.

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
9/18	Downing; P. Cox, CDF; L. Hastings, Walker For. Co.	Redding, Benton Fld	Latour St. For. & Walker For.	1:20	:35 (from Fall Rvr)	Moderate Dm loss in SP N. of Latour Butte; light Db loss along Cow Cr. below Lookout Mtn & W. of Jacks Backbone; heavy mistletoe damage in white fir N. & NE of Latour Butte.
"	Furniss, Downing; R. Andre, Shasta For. Co.	Redding, Benton Fld	Private lands E. of Redding & part of Lassen N.F.	1:10	:35 (to Chico)	No appreciable loss.
9/19	Downing	Chico AP	Private lands NE of Chico & parts of Lassen N.F. & N.P.	2:05	-	Light Db loss from Promontory Pk. NE to Devils Parade Ground & 5 mi SW of Turner LO N. of Howard Cr. (old burn); light Dm loss in SP N. of Panther Cr., 2-4 mi SW of Grays Pk; moderate Db or Dj loss between Snag Lake & Widow Lake, around Bogard Butte LO, 2 mi NE of Caribou Lake, around Harvey Mtn LO (known), S & SE of Star Butte LO, and SW of Roop Mtn; moderate mistletoe damage S. of Brokeoff Mtn LO.
"	Downing; H.B. Turner, Plumas N.F.	Chester AP	Plumas N.F.	2:10	1:35 (to Sac'to)	Known sawfly damage in white fir near Whiskey Diggins; known Dj loss in JP near Thompson Pk; moderate Db or Dj loss E. & S. of Mt. Ingalls LO & N. side of Big Grizzly Valley; moderate white fir loss N. of Squaw Valley Pk; heavy Db or Dj loss S. of Crystal Pk at head of Galeppi Cr.; light Db or Dj loss at W. end of Squaw Valley & on the SW side of Red Clover Cr. N. of Mt. Ingalls LO.

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
9/21	Downing	Sacramento	Part of Tahoe N.F.	1:10	-	Heavy white fir loss SE of Van Norden Lake near Donner Pass; light Db or Dj loss near Gov't Spr., west of Big Valley Bluff LO
"	"	Reno Hubbard Fld	Tahoe N.F. & private holdings	2:10	-	Light Db & Ips loss near Greenville; poor visibility on this flight.
9/22	Wickman, Downing	Carson City AP	E. half Eldorado N.F.	1:30	-	No important loss noted.
9/23	Wickman; V.O. Goodwin, Toiyabe N.F.	"	W. side Toiyabe N.F.	1:20	-	Known heavy loss at Crystal Bay, Lake Tahoe
"	Wickman	"	W. half Tahoe N.F.	1:30	1:15 (to Fresno)	Light loss in PP by Db & Ips on Humberg Ridge S. of Highway #49.
9/24	Wickman; R. Branges, Sequoia N.P.	Visalia AP	Sequoia NP	1:40	:25 (from Fresno)	Scattered light loss in SP by Dm.
"	Wickman	"	Sequoia N.F.	2:35	:25 (to Fresno)	Scattered light loss in SP by Dm. Moderate fir loss by Scolytus S. of Sheep Mt.
9/25	Wickman; E. Ernst, Yosemite N.P.	Fresno Chandler Fld	Yosemite N.P.	2:15	-	Scattered light loss of SP by Dm throughout Park, moderate SP loss by Dm near Laurel Lake; Heavy defoliation in LP by needle-miner in back country Tuolumne Watershed.

1980

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
9/25	Wickman	Fresno Chandler Fld	Sierra N.F.	2:45	-	Moderate JP loss by Dj near Beasore Mdws; moderate PP by Db and SP by Dm near Nelder Grove on Big Trees.
9/26	Wickman; B.S. Sweatt, Inyo N.F.	Bishop AP	Inyo N.F.	3:00	2:20 (from & to Fresno)	Scattered moderate loss of LP by Dm S. of June Lake, scattered loss in LP by Dm and RF by Scolytus around Reds Mdws. Scattered moderate JP loss by FH, mammoth area.
9/28	Wickman; N.E. Dircksen, Stanislaus N.F.	Columbia AP	Stanislaus N.F.	1:30	:45 (from Fresno)	Scattered light loss of SP by Dm throughout Forest. Moderate SP loss by Dm near Grohls Upper Camp.
"	Wickman; S. Bryan, Calaveras Land & Tmbr Corp.	Jackson AP	Calaveras Land & Tmbr Corp. ownership	1:00	:15 (from Columbia)	Heavy top-kill by Pityophthorus in Forest Cr. & Buck Ranch areas. Fairly heavy concentrations of PP loss by Db & SP by Dm on N. slope Blue Mt. (approx 20 trees).
"	Wickman; R. Maben, Winton Lbr Co.	"	Winton Lbr Co. ownership	:55	-	Heavy top-kill by Pityophthorus, Forest Cr. area. Light scattered SP loss by Dm.
9/29	Wickman	Jackson AP	West half Eldorado NF	1:00	1:20 (Sac'to for repairs)	Scattered light loss of PP by Db & SP by Dm & heavy top-kill by Pityophthorus near Long Canyon. Medium PP loss by Db on Robbs Peak; light scattered loss of SP by Dm and PP by Db along Highway #50.

189

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
9/29	Wickman E.E. Bailey, CDF	Jackson AP	State & private holdings E. of Jackson	1:45	-	Moderate loss of PP by Db and Ips near Fiddletown. Moderate scattered loss of PP by Db & SP by Dm in Calaveras Big Trees State Park.
9/30	Downing; F.E. Tucker, Klamath N.F.	Yreka, Siskiyou Co. AP	Klamath N.F.	2:30	2:05 (from Jackson AP)	Heavy Db loss in pine around burn below Lower Devils Peak LO; heavy Douglas-fir loss on W. side of Thompson Cr., NE of Slater Butte LO; moderate Douglas-fir loss generally throughout area between Happy Camp & Somes Bar on both sides of Klamath Rvr; moderate Db loss in pine N. & W. of road to Ukonom Mtn LO; moderate Db & Ips loss in pine between Grider & Lake Mtn LO; light Douglas-fir loss N. of road between Somes Bar & Sawyers Bar; heavy mistletoe damage between Condrey Mtn & Dry Lake.
"	Downing	"	West half Shasta N.F.	1:15	- (to Redding)	No important loss noted.
10/1	"	Redding, Benton Fld	East half Trinity N.F.	1:00	:55 (to Willows)	No important loss noted. Bad weather prevented full coverage of this Forest.
"	Downing; K.A. Cuff, Mendocino N.F.	Willows AP	Mendocino N.F.	2:00	1:00 (to Concord)	Heavy Db loss in pine along Bear Wallow Ridge; heavy Db & Ips loss between Poison Rock LO & Black Butte River; heavy Db loss E. & S. of Hull Mtn LO, particularly around old burn; heavy Db loss W. of Lake Pillsbury 2-4 mi & just N. of main road to Ukiah; known moderate pine loss NE of Goat Mtn LO;

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
10/1	(continued)					moderate Db loss in pine along McCoy Ridge NE of Haydon Rock; moderate Db & Ips loss E. of road 2 mi S. of Low Gap GS; light Db & Ips loss in pine, plus white fir loss NE of Mt. Sanhedrin LO.
10/2	Mackiewicz alone	Concord Buchanan Fld	Ferry time	-	2:35 (to Bakersfield)	-- -- -- -- --
10/3	Downing; A. Sheldon, Los Padres N.F.	Bakersfield Municipal AP	Los Padres N.F.	3:20	1:10 (to San Bernardino)	Known infestations on Zaca & Figueroa Mtns, on the E. side of Mt. Pinos & in Grade Valley; light Db or FH loss in pine along Snowy Cr.; light Db or FH loss in pine on Big Pine Mtn; moderate Db or FH loss in pine on Little Pine Mtn; moderate FH or Db loss in pine W. of Mill Potrero & on Tecuya Mtn.
10/5	Downing; G.P. Lang, San Bernardino N.F.; P. Sischo, CDF	San Bernardino AP	N. half San Bernardino N.F.	2:35	-	Known infestations in Arrowhead-Crestline area (light), Holcomb Valley (moderate), & Barton Flats (light); heavy Db or Dj loss in pine at head of Cienaga Seca Cr.
10/5	Downing; J.C. Gilman, San Bernardino N. F.	Banning AP	S. half San Bernardino N.F.	1:10	:50	Known infestation in San Jacinto insect control zone (moderate); heavy Db or FH loss in pine near head of Hurkey Cr.; moderate Ips top-killing in pine in Garner Valley.

DATE	FLIGHT PERSONNEL	FLOWN FROM	AREA FLOWN	SURVEY TIME	FERRY TIME	OBSERVATIONS
10/6	Downing	San Bernardino AP	Cleveland N.F.	1:45	1:15	Known infestations at Julian (very heavy), Cuyamaca State Park (light), Mt. Lagunas (light), Corte Madera (nothing showing); very heavy Db or FH loss in pine just W. of Mt. Palomar Observatory; heavy Db or FH loss in pine on W. side of Middle & North Peaks; very heavy loss in pine E. of Dyche Valley.
10/6	Mackiewicz alone	San Bernardino AP	Ferry time	-	4:00	-- -- -- -- --
10/7	" "	"	" "	-	7:00 (to Oklahoma City)	

Observations were based on faded trees and in most areas these would be 1952 kills. Therefore, actual current conditions can be determined only through ground checking which has been delayed in certain areas, particularly the north coast, because of other commitments.

Airports

When undertaking the job of contacting persons who are to accompany the Survey Crew on the various flights it is imperative that the person in charge know in advance which airports are best suited to the survey needs. The following list of suggested airports was compiled during the course of this year's aerial survey and those airports actually used on the 1953 survey are indicated by an asterisk:

Suggested List of Airports

Area to be Flown	City and Airport
Modoc N.F.	*Fall River Mills AP *Alturas AP
Lassen N.P.	*Fall River Mills AP
Lassen N.F.	*Fall River Mills AP *Chester AP *Redding, Benton Field
Plumas N.F.	*Chester AP (Avoid Quincy AP - in canyon and dangerous in wind)
Tahoe N.F.	Marysville AP (Avoid Nevada City AP - short hump-backed runway - alternate, Auburn (fair)
Eldorado N.F.	Placerville AP *Jackson AP
Stanislaus N.F.	*Columbia AP *Jackson AP
Sierra N.F.	*Fresno, Chandler Field
Yosemite N.P.	*Fresno, Chandler Field
Sequoia N.P.	*Visalia AP
Sequoia N.F.	*Visalia AP
Inyo N.F.	*Bishop AP
Toiyabe N.F.	*Reno, Hubbard Field *Carson City AP
Klamath N.F.	*Yreka, Siskiyou County AP
Shasta N.F.	*Mt. Shasta City, Mott Field
Trinity N.F.	*Redding, Benton Field

Area to be Flown	City and Airport
Mendocino N.F.	*Willows AP
Los Padres N.F.	Santa Barbara AP *Bakersfield AP
Angeles N.F.	Ontario, International AP (Avoid Burbank AP and Inglewood AP - heavy smog and heavy air traffic)
San Bernardino N.F.	*San Bernardino AP *Banning AP
Cleveland N.F.	Ramona AP San Diego AP

The following airports have proven to be most desirable as main bases of operation for each of the following areas.

Area	City and Airport
Northeastern California	Fall River Mills AP
Central Sierra	Placerville AP
Southern Sierra	Fresno, Chandler Field
North Coast	Redding, Benton AP
Southern California	San Bernardino AP

This is by no means a complete list of available airports from which the above-named areas can be flown. This list should be added to following the completion of each year's aerial survey. Notes should be taken concerning any airport found to be undesirable for this type of flying.

An up-to-date Airman's Guide should be carried by the crew and consulted to determine the state of repair of any airport to be used.

Costs

Survey costs were as follows:

Salaries	$579.20
Per diem & misc. expenses	565.90
Airplane operation and maintenance	1347.03

Approximate acreage surveyed	15,000,000
Total flying time	89:00 hours
Average total cost per hour	$15.14
Average cost per hour of aircraft operation	2.27
Approximate cost per 100 acres	.11

The pilot's salary was paid by the Aircraft and Special Equipment Center, Oklahoma City, Oklahoma.

193

Discussion and Recommendations

The 1953 aerial survey coverage was fairly complete on the areas flown and would have approached the 100-hour survey mark considered adequate had it been possible to fly the entire timbered portion of the State. However, weather conditions being as unpredictable as they are in the fall of the year, it was necessary to eliminate from the aerial survey, portions of the northern coast of California due to cloudy weather, as well as the Angeles National Forest because of heavy smog.

In future aerial surveys it might be wise to plan on flying the north coast areas first and then if weather proves to be an obstacle they can be scheduled a week or two later while the plane is still in the northern half of the State. This year out of necessity the north coast was scheduled after the northern Sierra and southern Sierra and when bad weather forced cancellation of some areas it was too costly to bring the plane back up north from southern California. A suggested plan would be to fly the north coast first, northern Sierra second, southern Sierra third and southern California last.

The airplane used this year proved to be underpowered for the job and necessitated the elimination of from one to two persons from certain flights. In addition a good deal of time was lost in gaining the altitude necessary for complete coverage of many of the areas flown. Generally speaking, it was necessary to fly at an elevation between 8,000' and 11,000' on each flight with many flights in the Sierra Nevada Mountains going even higher. A plane capable of carrying at least four persons easily to an elevation of 15,000 feet, cruising at a speed of over 150 miles per hour with a low speed range of 80 to 100 miles per hour, and having good downward visibility would seem to be the most desirable for this survey.

As no ground checking has been done at this writing, it remains to be seen whether or not the aerial survey is most effectively flown in September and early October. However, it is felt by this writer that a good general picture of Statewide conditions, as well as serious local conditions, can be observed at this time of year thus allowing for ground checking before winter sets in.

On a survey of this type where the objective is to locate areas of serious infestation and not individual tree losses, it is felt that flying from an elevation of 1,500 feet to 2,000 feet above ground level affords a broader view of the countryside than tree-top flying and therefore reduces the number of strips necessary to fully cover any given area. If an area is spotted that requires closer inspection, then a flight at a lower elevation can be made. This system was used on the 1953 aerial survey.

Many changes in schedule were necessary during the course of the survey and the cooperation of those Federal, State, and private agencies participating is appreciated. The Berkeley Forest Insect Laboratory is particularly appreciative of the service rendered by the Oklahoma City Aircraft and Special Equipment Center in making available a plane and pilot, Val Mackiewicz, for the duration of this aerial survey.

Forest Insect Laboratory
Berkeley, California
November 12, 1953

G. L. Downing
Entomologist